

SEQUENCE LISTING

<110> Frohberg, Claus  
Koetting, Oliver

Ritte, Gerhard  
Steup, Martin

<120> Plants with reduced activity of a starch phosphorylating enzyme

<130> 65084.000023

<140> Unassigned

<141> 2006-09-01

<150> EP04090088.8

<151> 2004-03-05

<150> EP04090121.7

<151> 2004-03-29

<150> US60/550,022

<151> 2004-03-05

<150> EP04090203.3

<151> 2004-05-21

<150> EP04090484.9

<151> 2004-12-09

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<170> PatentIn version 3.1

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Page 7

195

200

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His Thr Ile Gln Asn Lys Leu His Arg Asn Ala Gly Pro Glu Asp Leu  
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Lys Ile Ser Met Asp Asp Arg Gly Leu Ser Ala Leu Asn Leu Phe Phe  
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450

455

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aca act ggg ctt gat gga ata gca ctg aaa ctg gtg gag ggc gat aaa Thr Thr Gly Leu Asp Gly Ile Ala Leu Lys Leu Val Glu Gly Asp Lys 255 260 265	819
gca tcc agg aac tgg tgg cgg aag tta gag gtt gtt cgc ggg ata ttg Ala Ser Arg Asn Trp Trp Arg Lys Leu Glu Val Val Arg Gly Ile Leu 270 275 280 285	867
tca gaa tct ttt gat gac cag agt cgt ctg ggg gcc ctt gta tac tca Ser Glu Ser Phe Asp Asp Gln Ser Arg Leu Gly Ala Leu Val Tyr Ser 290 295 300	915
gct att tat ctg aag tgg att tat aca ggt cag ata tcg tgc ttt gaa Ala Ile Tyr Leu Lys Trp Ile Tyr Thr Gly Gln Ile Ser Cys Phe Glu 305 310 315	963
gat ggt ggc cac cat cgg cct aac aaa cat gct gag ata tcg agg caa Asp Gly Gly His His Arg Pro Asn Lys His Ala Glu Ile Ser Arg Gln 320 325 330	1011
ata ttc cgt gaa ctt gaa atg atg tat tat ggg aaa acc aca tca gcc Ile Phe Arg Glu Leu Glu Met Met Tyr Tyr Gly Lys Thr Thr Ser Ala 335 340 345	1059
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gct aca gaa gtc atg ctt gct agg att act aag acc cct gga gaa tac Ala Thr Glu Val Met Leu Ala Arg Ile Thr Lys Thr Pro Gly Glu Tyr 415 420 425	1299

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gat Asp	ttc Phe	ttc Phe	aat Asn	gct Ala 450	ggc Gly	agc Ser	cta Leu	ttt Phe	gag Glu 455	caa Gln	ctg Leu	gag Glu	tcc Ser	atc Ile 460	aag Lys	1395
gaa Glu	tct Ser	ctg Leu	aac Asn 465	gag Glu	tca Ser	ggc Gly	tta Leu	gaa Glu 470	gtt Val	ctc Leu	tca Ser	tcc Ser	ttt Phe 475	gtg Val	gaa Glu	1443
acc Thr	aaa Lys	agg Arg 480	agt Ser	ttg Leu	gac Asp	caa Gln	gtg Val 485	gat Asp	cat His	gca Ala	gaa Glu	gat Asp 490	ttg Leu	gat Asp	aaa Lys	1491
aat Asn 495	gat Asp	acc Thr	att Ile	caa Gln	att Ile	ttg Leu 500	atg Met	act Thr	acc Thr	ttg Leu 505	caa Gln	tca Ser	tta Leu	tct Ser	tct Ser	1539
cta Leu 510	aga Arg	tcg Ser	gtt Val	cta Leu	atg Met 515	aag Lys	ggc Gly	ctt Leu	gaa Glu	agt Ser 520	ggc Gly	ctt Leu	aga Arg	aat Asn	gat Asp 525	1587
gcg Ala	cct Pro	gat Asp	aat Asn	gct Ala 530	ata Ile	gca Ala	atg Met	cga Arg	caa Gln 535	aag Lys	tgg Trp	cgc Arg	ctt Leu	tgt Cys 540	gaa Glu	1635
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aga Arg 575	aat Asn	act Thr	act Thr	cta Leu	tgg Trp	gat Asp 580	act Thr	act Thr	ctt Leu	gat Asp	gcc Ala 585	ctt Leu	gtc Val	att Ile	ggc Gly	1779
atc Ile 590	aat Asn	caa Gln	gtt Val	agc Ser	ttt Phe 595	tca Ser	ggt Gly	tgg Trp	aaa Lys	aca Thr 600	gat Asp	gaa Glu	tgt Cys	att Ile	gcc Ala 605	1827
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ctt Leu 655	tct Ser	ata Ile	ttc Phe	cct Pro	gaa Glu	aaa Lys 660	gta Val	atg Met	gtt Val	att Ile	ggg Gly 665	aaa Lys	gcc Ala	ctt Leu	gga Gly	2019
ata Ile 670	cca Pro	gat Asp	aac Asn	agt Ser	gtg Val 675	aga Arg	act Thr	tac Tyr	aca Thr	gag Glu 680	gca Ala	gaa Glu	att Ile	cgt Arg	gct Ala 685	2067

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gat gga gat gaa gag gtc aaa gct gct ggg gat aat ata gtt ggt gtt Asp Gly Asp Glu Glu Val Lys Ala Ala Gly Asp Asn Ile Val Gly Val 750 755 760 765	2307
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aca gat gtg tat ttg ctt gag gga aaa tat atc aga tta gaa gca tca Thr Asp Val Tyr Leu Leu Glu Gly Lys Tyr Ile Arg Leu Glu Ala Ser 800 805 810	2451
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tct aag caa aaa agc aaa tca gga gtg aat ggt agt ttt gct gct ctt Ser Lys Gln Lys Ser Lys Ser Gly Val Asn Gly Ser Phe Ala Ala Leu 865 870 875	2643
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Ser Phe Thr Ser 945 Leu Leu Glu Lys 950 Ile Glu Thr Ala Lys 955 Val Glu Asn	
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Gly Glu Val Asp Ser Leu Ala Leu Glu Leu Gln Ala 970 Ile Ile Ser His	
960 965 970	
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Leu Ser Pro Pro Glu Glu Thr Ile Ile Phe Leu Lys Arg Ile Phe Pro	
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990 1005	
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Ser Leu Met Asp Pro 1025 Cys Ala Phe Gly Ala 1030 Ala Val Gly Lys Val	
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Trp Ala Ser Leu Tyr 1040 Thr Arg Arg Ala 1045 Leu Ser Arg Arg Ala	
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Ala Gly Val Tyr Gln 1055 Arg Asp Ala Thr Met 1060 Ala Val Leu Val Gln	
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Glu Ile Leu Gln Pro 1070 Asp Leu Ser Phe Val 1075 Leu His Thr Val Cys	
1080	
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Pro Ala Asp His Asp 1085 Pro Lys Val Val Gln 1090 Ala Glu Val Ala Pro	
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Gly Leu Gly Glu Thr 1100 Leu Ala Ser Gly Thr 1105 Arg Gly Thr Pro Trp	
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Arg Leu Ser Cys Asn 1115 Lys Phe Asp Gly Lys 1120 Val Ala Thr Leu Ala	
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Phe Ser Asn Phe Ser 1130 Glu Glu Met Val Val 1135 His Asn Ser Gly Pro	
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Ala Asn Gly Glu Val 1145 Ile Arg Leu Thr Val 1150 Asp Tyr Ser Lys Lys	
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Pro Leu Ser Val Asp 1160 Thr Thr Phe Arg Lys 1165 Gln Phe Gly Gln Arg	
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Leu Ala Ala Ile Gly 1175 Gln Tyr Leu Glu Gln 1180 Lys Phe Gly Ser Ala	
1185	



cag gat gtg gaa ggt tgc ctg gtt ggg aaa gat att ttt ata gtg 3612  
Gln Asp Val Glu Gly Cys Leu Val Gly Lys Asp Ile Phe Ile Val  
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**<211> 1206**

<212> PRT

<213> Oryza sativa

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Cys Arg Gly Arg Ser Ala Ala Ser Ala Ala Glu Arg Thr Lys Glu Lys  
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Lys Arg Arg Asp Ser Ser Lys Gln Pro Leu Val His Leu Gln Val Cys  
65 70 75 80

Leu Glu His Gln Val Lys Phe Gly Glu His Val Gly Ile Ile Gly Ser  
85 90 95

Thr Lys Glu Leu Gly Ser Trp Glu Glu Gln Val Glu Leu Glu Trp Thr  
100 105 110

Thr Asn Gly Trp Val Cys Gln Leu Lys Leu Pro Gly Glu Thr Leu Val  
115 120 125

Glu Phe Lys Phe Val Ile Phe Leu Val Gly Gly Lys Asp Lys Ile Trp  
130 135 140

Glu Asp Gly Asn Asn Arg Val Val Glu Leu Pro Lys Asp Gly Lys Phe  
145 150 155 160

Asp Ile Val Cys His Trp Asn Arg Thr Glu Glu Pro Leu Glu Leu Leu  
165 170 175

Gly Thr Pro Lys Phe Glu Leu Val Gly Glu Ala Glu Lys Asn Thr Gly  
 180 185 190

Glu Asp Ala Ser Ala Ser Val Thr Phe Ala Pro Glu Lys Val Gln Asp  
 195 200 205

Ile Ser Val Val Glu Asn Gly Asp Pro Ala Pro Glu Ala Glu Ser Ser  
 210 215 220

Lys Phe Gly Gly Gln Trp Gln Gly Ser Lys Thr Val Phe Met Arg Ser  
 225 230 235 240

Asn Glu His Leu Asn Lys Glu Ala Asp Arg Met Trp Asp Thr Thr Gly  
 245 250 255

Leu Asp Gly Ile Ala Leu Lys Leu Val Glu Gly Asp Lys Ala Ser Arg  
 260 265 270

Asn Trp Trp Arg Lys Leu Glu Val Val Arg Gly Ile Leu Ser Glu Ser  
 275 280 285

Phe Asp Asp Gln Ser Arg Leu Gly Ala Leu Val Tyr Ser Ala Ile Tyr  
 290 295 300

Leu Lys Trp Ile Tyr Thr Gly Gln Ile Ser Cys Phe Glu Asp Gly Gly  
 305 310 315 320

His His Arg Pro Asn Lys His Ala Glu Ile Ser Arg Gln Ile Phe Arg  
 325 330 335

Glu Leu Glu Met Met Tyr Tyr Gly Lys Thr Thr Ser Ala Lys Asp Val  
 340 345 350

Leu Val Ile Arg Lys Ile His Pro Phe Leu Pro Ser Phe Lys Ser Glu  
 355 360 365

Phe Thr Ala Ser Val Pro Leu Thr Arg Ile Arg Asp Ile Ala His Arg  
 370 375 380

Asn Asp Ile Pro His Asp Leu Lys Gln Glu Ile Lys His Thr Ile Gln  
 385 390 395 400

Asn Lys Leu His Arg Asn Ala Gly Pro Glu Asp Leu Ile Ala Thr Glu  
 405 410 415

Val Met Leu Ala Arg Ile Thr Lys Thr Pro Gly Glu Tyr Ser Glu Thr  
 420 425 430

Phe Val Glu Gln Phe Thr Ile Phe Tyr Ser Glu Leu Lys Asp Phe Phe  
 435 440 445

Asn Ala Gly Ser Leu Phe Glu Gln Leu Glu Ser Ile Lys Glu Ser Leu  
 450 455 460

Asn Glu Ser Gly Leu Glu Val Leu Ser Ser Phe Val Glu Thr Lys Arg  
 465 470 475 480

Ser Leu Asp Gln Val Asp His Ala Glu Asp Leu Asp Lys Asn Asp Thr  
 485 490 495

Ile Gln Ile Leu Met Thr Thr Leu Gln Ser Leu Ser Ser Leu Arg Ser  
 500 505 510

Val Leu Met Lys Gly Leu Glu Ser Gly Leu Arg Asn Asp Ala Pro Asp  
 515 520 525

Asn Ala Ile Ala Met Arg Gln Lys Trp Arg Leu Cys Glu Ile Ser Leu  
 530 535 540

Glu Asp Tyr Ser Phe Val Leu Leu Ser Arg Phe Ile Asn Thr Leu Glu  
 545 550 555 560

Ala Leu Gly Gly Ser Ala Ser Leu Ala Lys Asp Val Ala Arg Asn Thr  
 565 570 575

Thr Leu Trp Asp Thr Thr Leu Asp Ala Leu Val Ile Gly Ile Asn Gln  
 580 585 590

Val Ser Phe Ser Gly Trp Lys Thr Asp Glu Cys Ile Ala Ile Gly Asn  
 595 600 605

Glu Ile Leu Ser Trp Lys Gln Lys Gly Leu Ser Glu Ser Glu Gly Cys  
 610 615 620

Glu Asp Gly Lys Tyr Ile Trp Ser Leu Arg Leu Lys Ala Thr Leu Asp  
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Arg Ala Arg Arg Leu Thr Glu Glu Tyr Ser Glu Ala Leu Leu Ser Ile  
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Phe Pro Glu Lys Val Met Val Ile Gly Lys Ala Leu Gly Ile Pro Asp  
 660 665 670

Asn Ser Val Arg Thr Tyr Thr Glu Ala Glu Ile Arg Ala Gly Ile Val  
 675 680 685

Phe Gln Val Ser Lys Leu Cys Thr Val Leu Gln Lys Ala Ile Arg Glu  
690 695 700  
Val Leu Gly Ser Thr Gly Trp Asp Val Leu Val Pro Gly Val Ala His  
705 710 715 720  
Gly Thr Leu Met Arg Val Glu Arg Ile Leu Pro Gly Ser Leu Pro Ser  
725 730 735  
Ser Val Lys Glu Pro Val Val Leu Ile Val Asp Lys Ala Asp Gly Asp  
740 745 750  
Glu Glu Val Lys Ala Ala Gly Asp Asn Ile Val Gly Val Ile Leu Leu  
755 760 765  
Gln Glu Leu Pro His Leu Ser His Leu Gly Val Arg Ala Arg Gln Glu  
770 775 780  
Asn Val Val Phe Val Thr Cys Glu Tyr Asp Asp Thr Val Thr Asp Val  
785 790 795 800  
Tyr Leu Leu Glu Gly Lys Tyr Ile Arg Leu Glu Ala Ser Ser Ile Asn  
805 810 815  
Val Asn Leu Ser Ile Val Ser Glu Lys Asn Asp Asn Ala Val Ser Thr  
820 825 830  
Glu Pro Asn Ser Thr Gly Asn Pro Phe Gln Gln Lys Leu Gln Asn Glu  
835 840 845  
Phe Ser Leu Pro Ser Asp Ile Glu Met Pro Leu Gln Met Ser Lys Gln  
850 855 860  
Lys Ser Lys Ser Gly Val Asn Gly Ser Phe Ala Ala Leu Glu Leu Ser  
865 870 875 880  
Glu Ala Ser Val Glu Ser Ala Gly Ala Lys Ala Ala Ala Cys Arg Thr  
885 890 895  
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900 905 910  
Val Pro Ala Ala Phe Arg Val Pro Ser Gly Ala Val Ile Pro Phe Gly  
915 920 925  
Ser Met Glu Asp Ala Leu Lys Lys Ser Gly Ser Leu Glu Ser Phe Thr  
930 935 940

Ser Leu Leu Glu Lys Ile Glu Thr Ala Lys Val Glu Asn Gly Glu Val  
 945 950 955 960

Asp Ser Leu Ala Leu Glu Leu Gln Ala Ile Ile Ser His Leu Ser Pro  
 965 970 975

Pro Glu Glu Thr Ile Ile Phe Leu Lys Arg Ile Phe Pro Gln Asp Val  
 980 985 990

Arg Leu Ile Val Arg Ser Ser Ala Asn Val Glu Asp Leu Ala Gly Met  
 995 1000 1005

Ser Ala Ala Gly Leu Tyr Asp Ser Ile Pro Asn Val Ser Leu Met  
 1010 1015 1020

Asp Pro Cys Ala Phe Gly Ala Ala Val Gly Lys Val Trp Ala Ser  
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Leu Tyr Thr Arg Arg Ala Ile Leu Ser Arg Arg Ala Ala Gly Val  
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Tyr Gln Arg Asp Ala Thr Met Ala Val Leu Val Gln Glu Ile Leu  
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Gln Pro Asp Leu Ser Phe Val Leu His Thr Val Cys Pro Ala Asp  
 1070 1075 1080

His Asp Pro Lys Val Val Gln Ala Glu Val Ala Pro Gly Leu Gly  
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Glu Thr Leu Ala Ser Gly Thr Arg Gly Thr Pro Trp Arg Leu Ser  
 1100 1105 1110

Cys Asn Lys Phe Asp Gly Lys Val Ala Thr Leu Ala Phe Ser Asn  
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Phe Ser Glu Glu Met Val Val His Asn Ser Gly Pro Ala Asn Gly  
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Glu Val Ile Arg Leu Thr Val Asp Tyr Ser Lys Lys Pro Leu Ser  
 1145 1150 1155

Val Asp Thr Thr Phe Arg Lys Gln Phe Gly Gln Arg Leu Ala Ala  
 1160 1165 1170

Ile Gly Gln Tyr Leu Glu Gln Lys Phe Gly Ser Ala Gln Asp Val  
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<213> *Oryza sativa*, *Arabidopsis thaliana*

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<212> PRT

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<220>

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1				5					10					15		

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Gly	Leu	Glu	Asp	Tyr	Ala	Phe	Val	Leu	Leu	Ser	Arg	Phe	Val	Asn	Ala	
			20					25					30			

gtt	gaa	gct	cta	ggc	gga	gct	gat	tgg	ctt	gca	gag	aat	gta	aca	gtg	144
Val	Glu	Ala	Leu	Gly	Gly	Ala	Asp	Trp	Leu	Ala	Glu	Asn	Val	Thr	Val	
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atc	caa	cag	cta	ggc	ata	tct	ggc	tgg	aag	ccc	gag	gaa	tgc	aaa	gct	240
Ile	Gln	Gln	Leu	Gly	Ile	Ser	Gly	Trp	Lys	Pro	Glu	Glu	Cys	Lys	Ala	

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Val Gly Asn Glu Leu Leu Ser Trp Lys Glu Arg Gly Ile Ser Glu Ile	85	90	95	
gaa ggc agc gaa gat ggt aag act ata tgg gca tta aga cta aaa gcg				336
Glu Gly Ser Glu Asp Gly Lys Thr Ile Trp Ala Leu Arg Leu Lys Ala	100	105	110	
act ctt gat aga agt cga agg tta act gag gag tat tcc gag aca ctt				384
Thr Leu Asp Arg Ser Arg Arg Leu Thr Glu Glu Tyr Ser Glu Thr Leu	115	120	125	
ctc caa ata ttc cct gaa a				403
Leu Gln Ile Phe Pro Glu	130			

<210> 11

<211> 134

<212> PRT

<213> Solanum tuberosum

<400> 11

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Val Glu Ala Leu Gly Gly Ala Asp Trp Leu Ala Glu Asn Val Thr Val	35	40	45	
Lys Asn Ile Ser Ser Trp Asn Asp Pro Ile Gly Ala Leu Thr Val Gly	50	55	60	
Ile Gln Gln Leu Gly Ile Ser Gly Trp Lys Pro Glu Glu Cys Lys Ala	65	70	75	80
Val Gly Asn Glu Leu Leu Ser Trp Lys Glu Arg Gly Ile Ser Glu Ile	85	90	95	
Glu Gly Ser Glu Asp Gly Lys Thr Ile Trp Ala Leu Arg Leu Lys Ala	100	105	110	
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Leu Gln Ile Phe Pro Glu				



130

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